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14. ABSTRACT JP-8 is the preferred fuel for Air Force transport and fighter aircraft. In general, JP-8 acceptance specifications focus on physical properties of the fuel such as vapor pressure, boiling range, and thermal stability. Very little work has been performed to identify and measure the metals that may be present in JP-8 at an operating airbase. There is an interest in the catalytic processing of JP-8 into other materials as a means to improve aircraft performance, or to reduce the logistics associated with airbase operations. The goal of this project was to develop an analytical method for the determination of metals by direct aspiration ICP/OES. We will discuss some of the challenges uncovered during method development and provide results generated by the method.					
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# The Measurement of Trace Metals in JP-8 by ICP-OES

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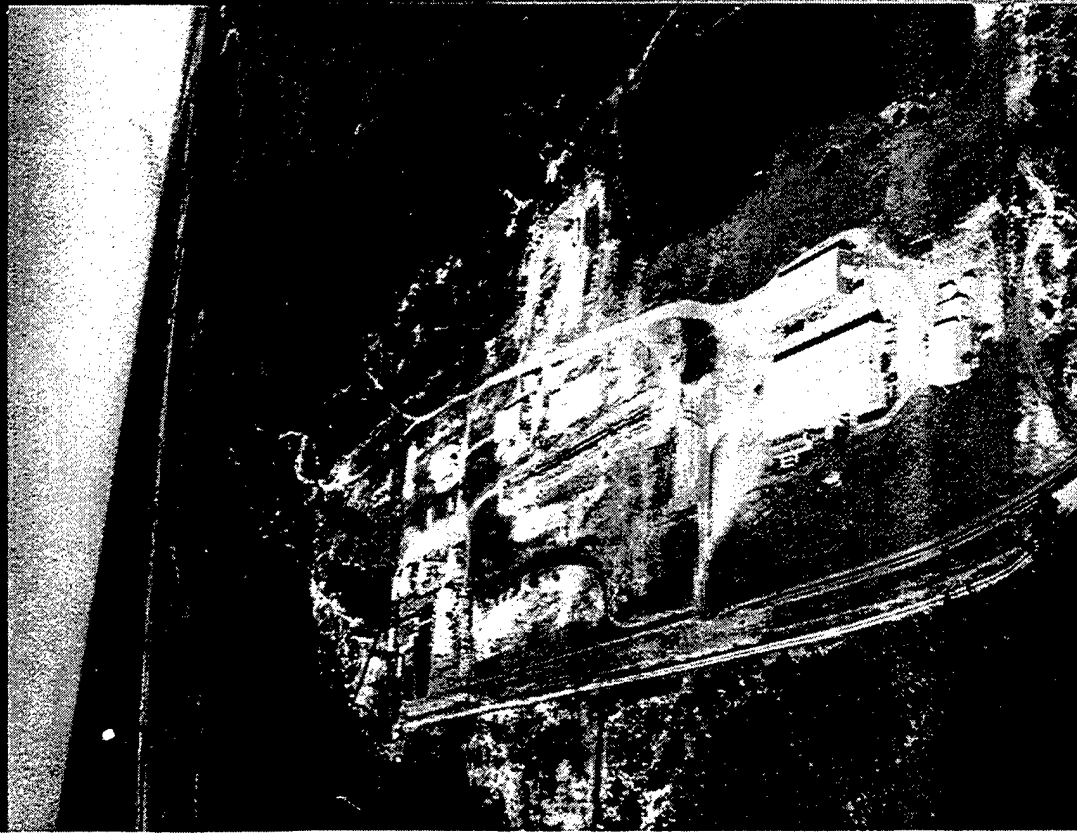


## ➤ Organizational Background

- Description
- Resources Profile
- Research Thrust Areas

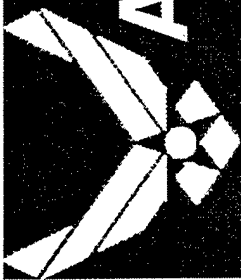
## ➤ Research Areas and Programs

- Robotics Research
- Engineering Mechanics
- Explosives Effects
- Explosive Ops & Support
- Chemical/Biological Defense



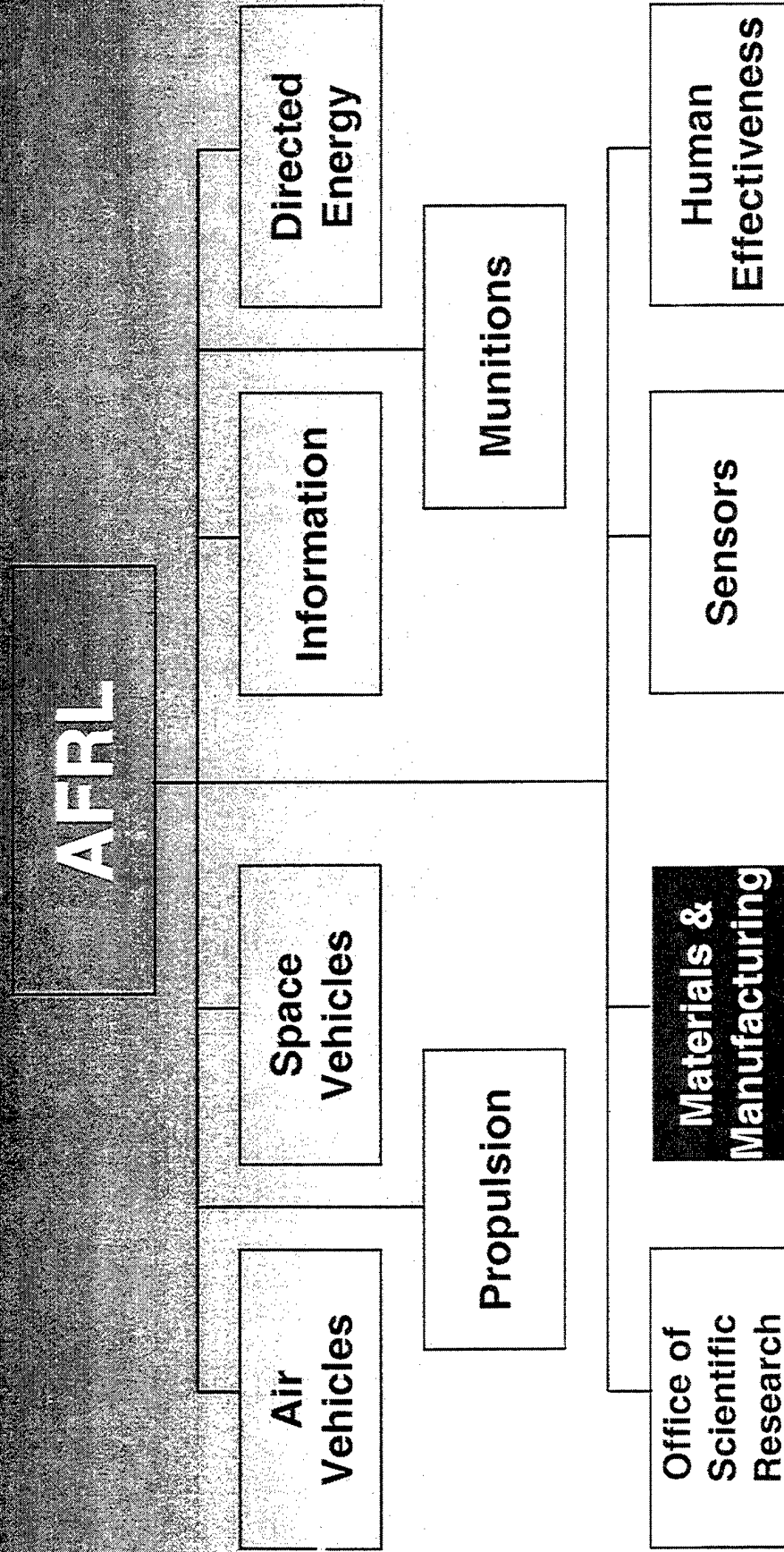
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# Air Force Research Laboratory

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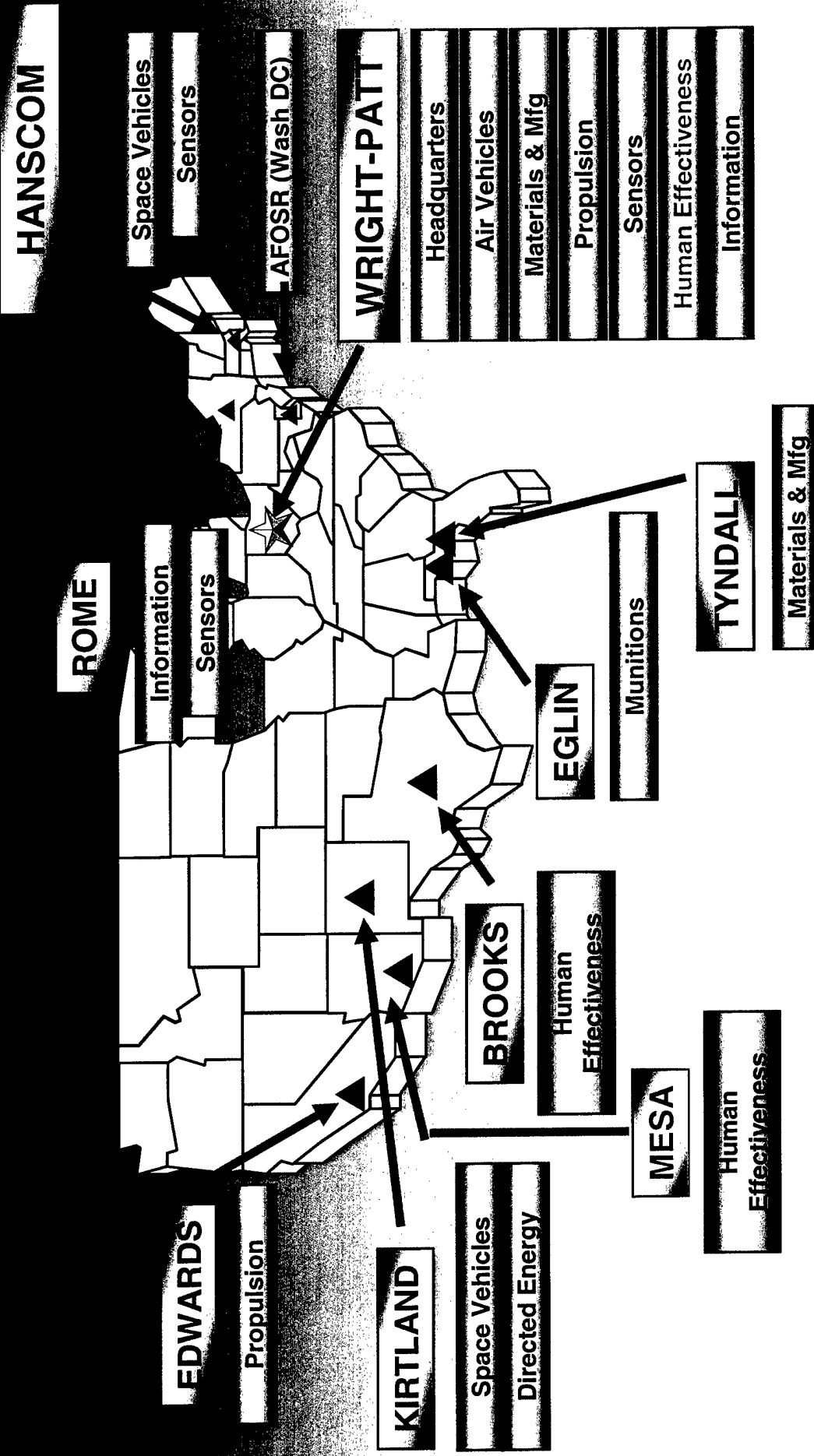


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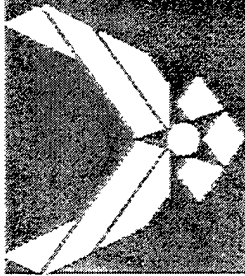


# Air Force Research Laboratory LOCATIONS



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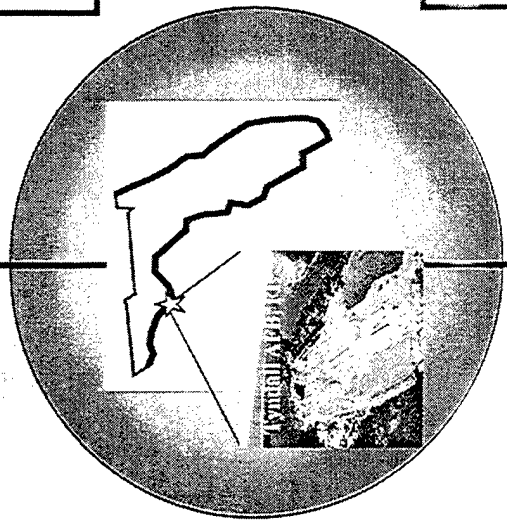
# AFRL - Tyndall AFB

## Airbase Technologies Division

MLQ

Operations  
Support Branch  
(MLQO)

Weapons Systems  
Logistics Branch  
(MLQL)



Deployed Base  
Systems Branch  
(MLQD)

Force Protection  
Branch  
(MLQF)

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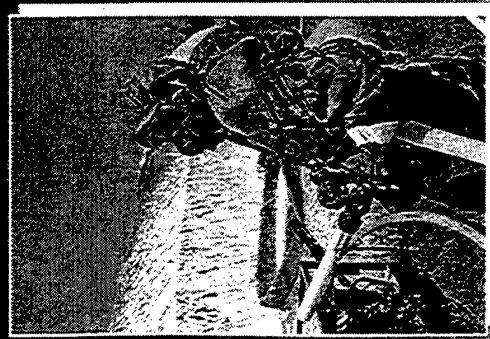
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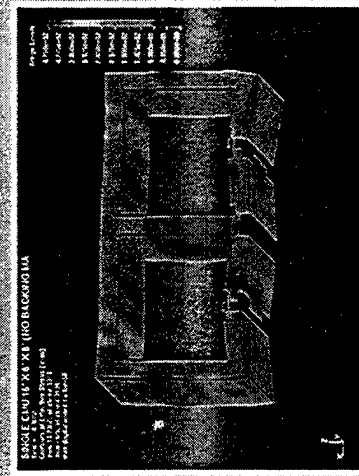
## Airbase Technologies Division

### Force Protection Branch MLQF



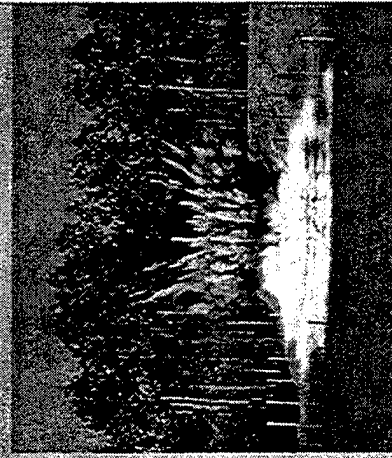
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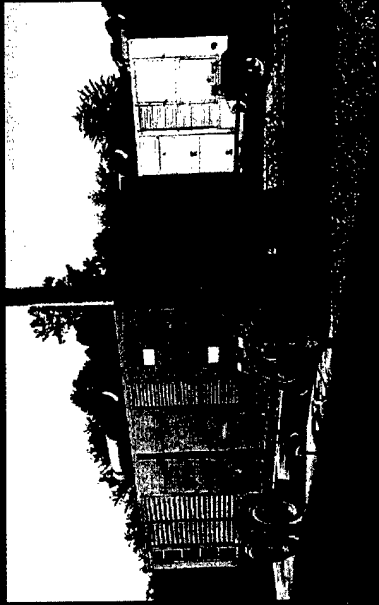
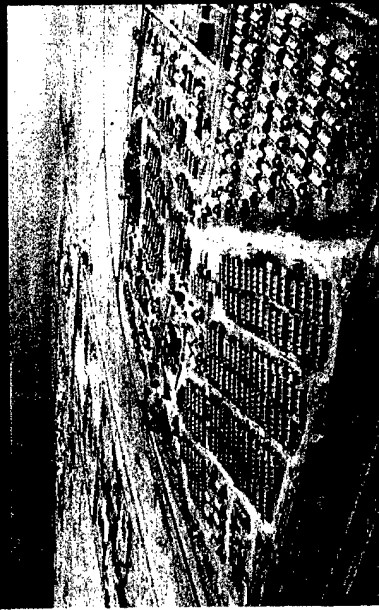
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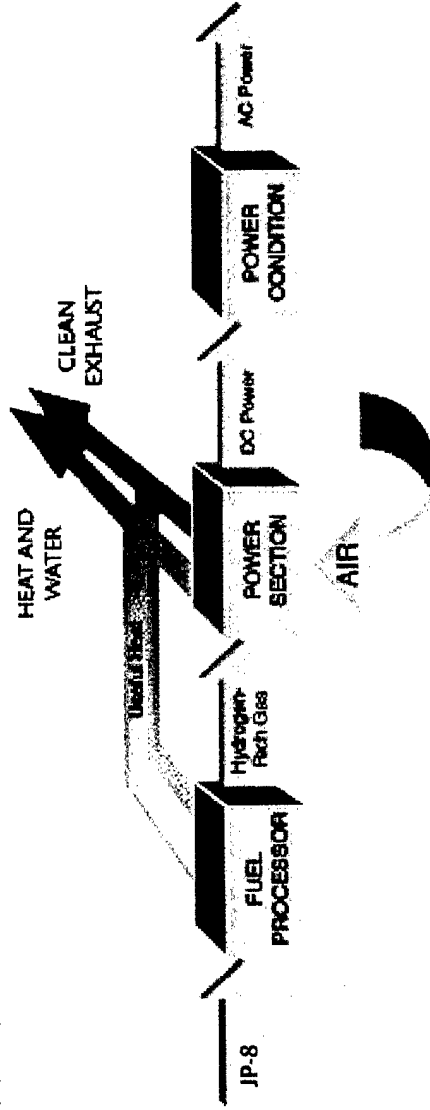
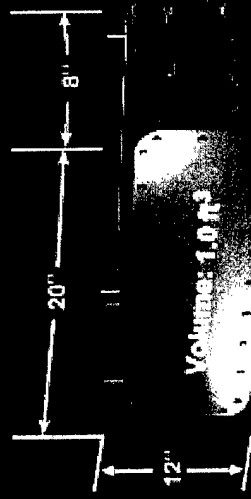




# Deployable Fuel Cell Reformer



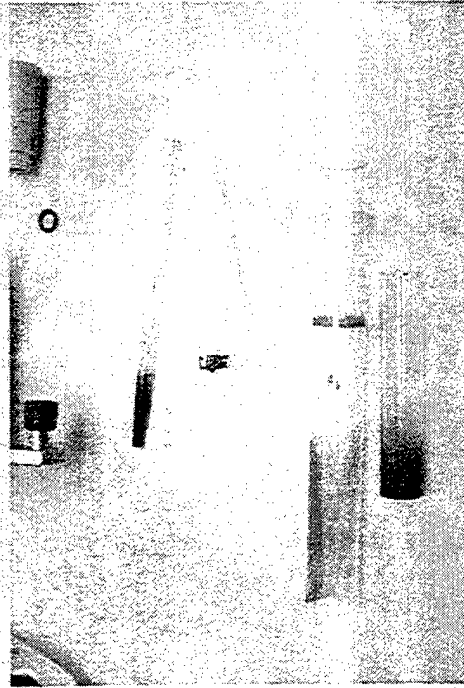
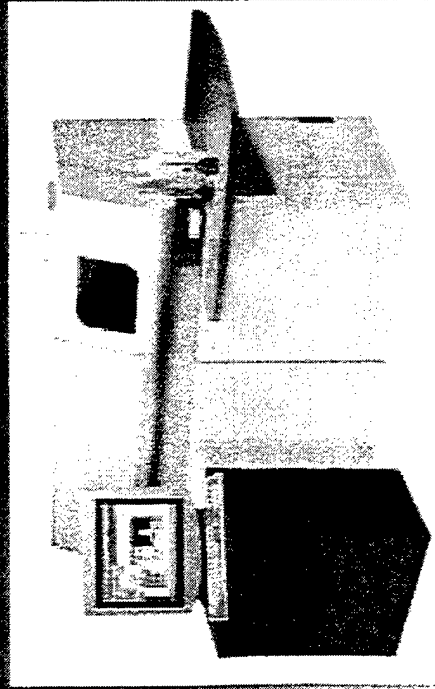
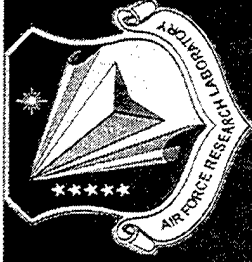
100 kW Logistics Fuel Processor



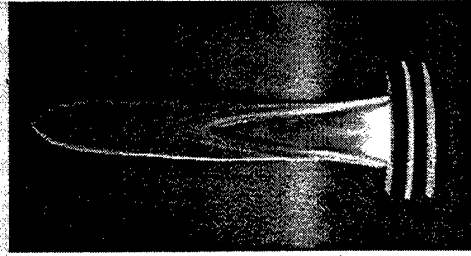
- 50% Reduction in Power Deployment Airlift
- Increase in MTBF from 500 to 2200 hrs
- Savings of 1800 gallons of fuel/day (1100 man deployment)
- Reduced Acoustic / Thermal / Environmental Emissions



# ICP System



- Thermo Irits Advantage  
Dual View (Axial)  
Simultaneous ICP  
175-800 nm
- GE ABC Fully Demountable  
Torch
- GE MicroMist Nebulizer



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## ➤ **Objective**

- Minimal Sample Prep
- Sensitive
- Metals, Phosphorus, Sulfur

## ➤ **Challenges**

- Prior Work
- Blanks
- Matrix Effects
- Standards
- Sampling/Storage/Stability

## ➤ **Results**

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➤ **Blank Solutions**

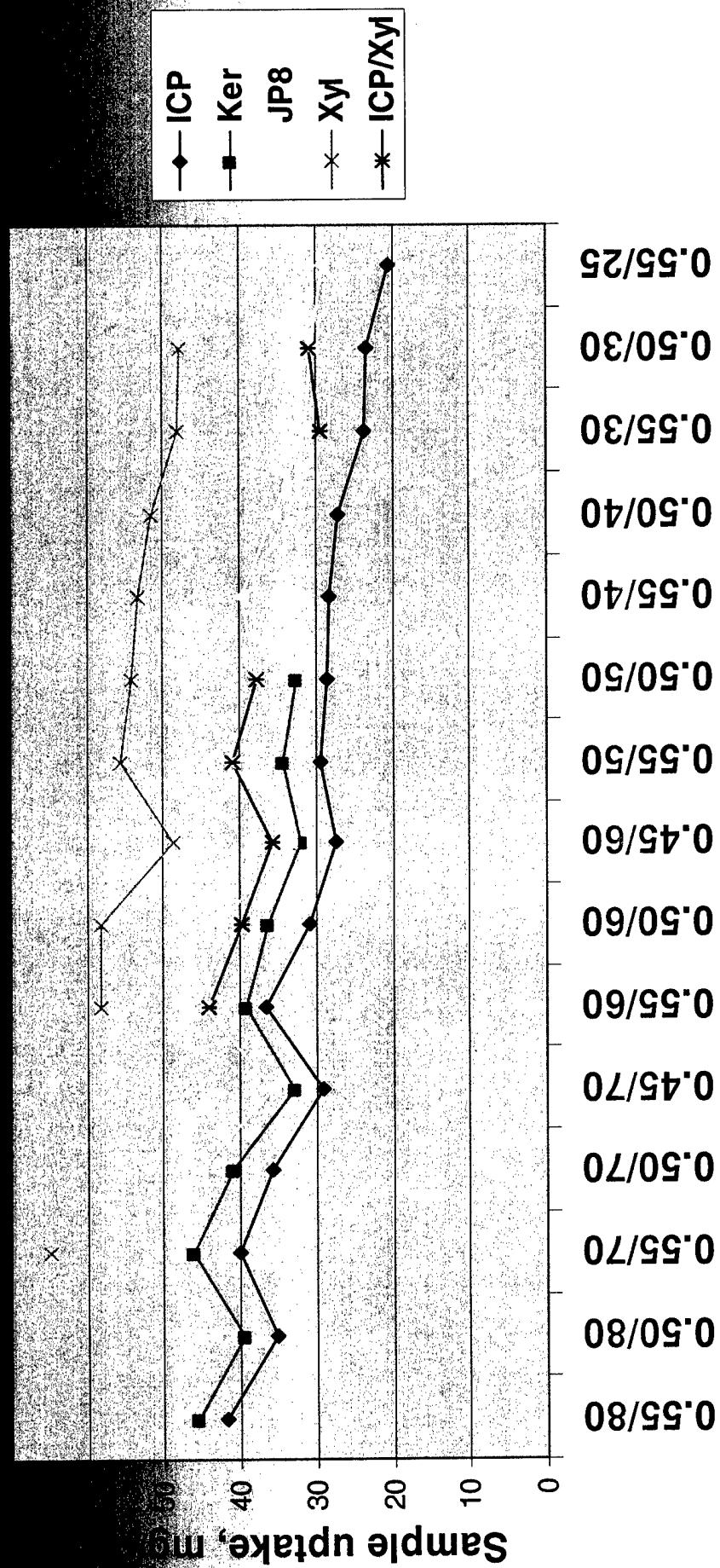
- JP-8: S; Cu, Si, P; some Al, Fe
- Kerosenes: Al, P
- Conostan Premisolv

➤ **Solvent Uptake Rate**

Neb flow lpm	pump rpm	Premisolv mg/min	Kerosene mg/min	JP-8 mg/min
0.55	80	41.9	45.4	48.7
0.5	80	35.1	39.6	43.5
0.55	70	40.0	46.0	48.6
0.5	70	35.7	40.8	45.2
0.55	60	36.5	39.3	44.6
0.5	60	30.9	36.3	42.6
0.55	50	29.3	34.4	41.0
0.5	50	28.5	32.6	37.7

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# Analytical Conditions

Power: 1350W

Solvent: 80:20 mixture (wt/wt) Premisolv: Xylene

Nebulizer: GE MicroMist; 400 uL/min

Injector tube: 1mm I.D.

Tubing: Glass Expansion, Viton, orange/yellow

Pump seed: 60 rpm

Nebulizer Flow: 0.53 l/min (.50 - .55)

Sample Uptake: 40 mg/min

Internal Std: Sc2554, Sc3353; 800 ppb



# Results



Ca	2.4	-1.8	14.4	14.8
Cr	1.2	-0.6	11.1	11.6
Cu	0.8	5.4	3.6	0.4
Fe	1.1	3.5	-4.7	16.3
Mo	0.9	-1.9	-11.4	12
Ni	3.0	3.3	10.7	12
P	4.3	57.4	59.8	-
S	16.6	391000	-	-
Si	2.3	40.2	39.2	40.3
Sn	4.6	2.7	-6.8	18.5
Ti	0.6	1.3	3.3	19.5
Zn	0.4	4.2	11.2	11.6



Work to be done:

Sample Storage:

Glass: Sorption; Si

Polyethylene: Phosphorus Leaching

Working Standards: daily prep



# Acknowledgements

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